

WHAT IS CLAIMED IS:

1. An ink jet record head comprising:  
said head has:  
a flow path composition substrate having a  
5 plurality of nozzles through which liquid flows, a  
supply chamber for supplying the liquid to each of  
the nozzles, and a plurality of discharge ports which  
are nozzle end openings for discharging a liquid  
droplet, said nozzle comprised of a bubbling chamber  
10 in which bubble is generated by a discharge energy  
generating element for generating thermal energy for  
discharging the liquid droplet, discharge port  
portions including said discharge ports and  
communicating between said discharge ports and said  
15 bubbling chamber, and a supply path for supplying the  
ink to the bubbling chamber; and  
an element substrate on which said discharge  
energy generating element is provided and joining  
said flow path composition substrate with a principal  
20 surface, wherein  
said discharge port portion has:  
a first discharge port portion including said  
discharge port and having a cross section  
approximately constant against a discharge axis; and  
25 a second discharge port portion contiguous to  
the first discharge port portion with an uneven  
portion and communicating with said bubbling chamber

while having the cross section parallel with the principal surface of said element substrate and larger than the cross section of the first discharge port portion, and

5 a distance of the uneven portion farthest from a supply direction of said second discharge port portion is shorter than the distance of said uneven portion in an arrangement direction of said discharge ports.

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2. The ink jet record head according to claim 1, wherein an opening face on said first discharge port portion side of said second discharge port portion intersecting said discharge axis is a sectional shape  
15 congruent with the opening face on said bubbling chamber side of said second discharge port portion intersecting said discharge axis, and on any cross section going through the center of said discharge port and vertical to the principal surface of said  
20 element substrate, a side wall of said second discharge port portion is represented by a straight line, and the opening face on said first discharge port portion side of said second discharge port portion, the opening face on said bubbling chamber  
25 side thereof and the principal surface of said element substrate are parallel.

3. The ink jet record head according to claim 1,  
wherein an opening face on said first discharge port  
portion side of said second discharge port portion  
intersecting said discharge axis is a similar figure  
5 to the opening face on said bubbling chamber side of  
said second discharge port portion and is also a  
sectional shape of smaller area than the opening face  
on the bubbling chamber side, and on any cross  
section going through the center of said discharge  
10 port and vertical to the principal surface of said  
element substrate, a side wall of said second  
discharge port portion is represented by a straight  
line, and the opening face on said first discharge  
port portion side of said second discharge port  
15 portion, the opening face on said bubbling chamber  
side thereof and the principal surface of said  
element substrate are parallel.

4. The ink jet record head according to claim 3,  
20 wherein the opening face on said first discharge port  
portion side of said second discharge port portion  
intersecting said discharge axis and the opening face  
on said bubbling chamber side thereof are ellipses or  
ovals.

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5. The ink jet record head according to claim 4,  
wherein the opening face on said first discharge port

portion side of said second discharge port portion intersecting said discharge axis is inscribed in said discharge port portion at two points.

5       6. The ink jet record head according to claim 1, wherein the opening face on said bubbling chamber side of said second discharge port portion intersecting the discharge axis is an ellipse or an oval and the opening face on the first discharge port 10 portion side of said second discharge port portion is rendered as a circle and inside the ellipse or oval which is the opening face on the bubbling chamber side of said second discharge port portion, and on any cross section going through the center of said 15 discharge port and vertical to the principal surface of said element substrate, a side wall of said second discharge port portion is represented by a straight line, and the opening face on said first discharge port portion side of said second discharge port 20 portion, the opening face on said bubbling chamber side thereof and the principal surface of said element substrate are parallel.

7. The ink jet record head according to claim 6, 25 wherein the opening face on the first discharge port portion side of said second discharge port portion is a circle congruent with the opening face on said

bubbling chamber side of said first discharge port portion in a plan perspective view for viewing it from a vertical direction to the principal surface of said element substrate.

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8. The ink jet record head according to claim 1, wherein said nozzles are formed by orthogonalizing a discharge direction in which liquid droplets fly from the discharge port and a flow direction of the liquid 10 flowing in said supply path.

9. The ink jet record head according to claim 1, wherein said flow path composition substrate has a plurality of said discharge energy generating 15 elements and a plurality of said nozzles, and is equipped with a first nozzle array having the nozzles in a longitudinal direction arranged in parallel and a second nozzle array having the nozzles in the longitudinal direction arranged in parallel at 20 positions opposed to the first nozzle array across said supply chamber respectively while the nozzles in the second nozzle array are arranged so that the pitches among the adjacent nozzles are mutually deviated by a 1/2 pitch against the nozzles in the 25 first nozzle array.

10. The ink jet record head according to claim

1, wherein the bubbles generated by said discharge energy generating element communicate with the outside air.

5           11. The ink jet record head according to claim 2, wherein the bubbles generated by said discharge energy generating element communicate with the outside air.

10          12. The ink jet record head according to claim 3, wherein the bubbles generated by said discharge energy generating element communicate with the outside air.

15          13. The ink jet record head according to claim 4, wherein the bubbles generated by said discharge energy generating element communicate with the outside air.

20          14. The ink jet record head according to claim 5, wherein the bubbles generated by said discharge energy generating element communicate with the outside air.

25          15. The ink jet record head according to claim 6, wherein the bubbles generated by said discharge energy generating element communicate with the

outside air.

16. The ink jet record head according to claim  
7, wherein the bubbles generated by said discharge  
5 energy generating element communicate with the  
outside air.

17. The ink jet record head according to claim  
8, wherein the bubbles generated by said discharge  
10 energy generating element communicate with the  
outside air.

18. The ink jet record head according to claim  
9, wherein the bubbles generated by said discharge  
15 energy generating element communicate with the  
outside air.